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ABSTRACT

Answers to 27 questions about aeronautics, space, and the National Aeronautics and Space Administration (NASA) are provided in this pamphlet. Among the topics dealt with in these questions are: costs of the space program; NASA's role in aeronautics; benefits received from the space program; why the United States hasn't developed means of rescuing individuals who are in trouble on space missions; how to write to an astronaut or receive an astronaut's autograph; courses that should be taken in school in order to become a NASA astronaut or scientist; how to obtain NASA educational materials; and NASA activities with elementary and secondary schools. Current addresses for obtaining materials and/or additional information are included when applicable. (JN)

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Questions & Answers about aeronautics and space

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Q&A

Why explore space?

The exploration of space is producing practical benefits in the form of:

Knowledge – Exploration advances scientific and technical knowledge and contributes to improving life on Earth.

Applications – Spacecraft are already in constant service for communications, television transmissions, navigation, weather observations, and Earth environmental surveys.

Technology – Progress stimulated by the space program is contributing to advances in medicine, transportation, electronics, manufacturing – in fact, nearly every form of human activity.

Economics – The space program helps expand our technological base, stimulating the development of improved products and processes that increase our ability to compete in world markets. In this way, the program makes a significant contribution to the export, or plus, side of our balance of trade.

What does the space program cost me as an individual?

Less than one cent of each federal tax dollar goes to the NASA space program. To divert funds from the space program would not add significantly to the budget for other government programs, but it would be a severe blow to the advances in technology, the growth of knowledge, the economic advantages, and the practical benefits produced by the space program. And it is important to recognize that technological progress plays a vital role in the solution of social problems, as well as in developing an extended tax base to increase support of social programs.

What benefits have we received from the space program?

Benefits are both tangible and intangible. The latter includes such things as the stimulus to learning, scientific discoveries, new technology, national pride, and improved international relations.

Some tangible and direct benefits now taken for granted are a global weather satellite system, making possible more accurate weather forecasts to help save lives and crops, and a worldwide satellite communications system. We also have airplane communications and ocean navigation satellites that provide increased safety in the air and on the sea, as well as additional economic benefits.

Practical everyday benefits include: fire-resistant fabrics and paint, smaller and longer lasting radios and TVs, tougher plastics, stronger adhesives, equipment that makes it possible for more hospital patients to receive better care with fewer nurses, a heart monitor inserted through a hypodermic needle rather than by surgery, improved computer technology, and a host of others.

What is NASA's role in aeronautics?

Basically it is to assure that the nation maintains its lead in the development of military and commercial aircraft technology. For this reason NASA does advanced research in subsonic, transonic, supersonic, and hypersonic aircraft. However, new concepts and designs are studied for all manner of aircraft, including those used in general aviation. Other focal points of NASA's aeronautical research include improving aircraft fuel economy and air safety, and reducing bothersome aircraft noise.

How does the United States cooperate with other countries in space projects?

The United States has made considerable efforts to develop international cost sharing in space research and applications.

The first international manned rendezvous and docking in space took place in July 1975, during the historic joint U.S./Soviet mission, the Apollo-Soyuz Test Project.

World-wide interest in Space Shuttle capabilities and a planned Space Station has sparked increased sharing of space costs.

The European Space Agency, composed of 11 member nations, invested more than $750 million to construct Spacelab, a reusable spaceborne laboratory that is transported into orbit by the Space Shuttle and remains attached inside the orbiter's cargo bay.

The Canadian government funded and built a remote manipulator arm. Installed inside the orbiter's cargo bay, the robot arm plucks out payloads and places them into independent orbit. The arm also retrieves payloads from space, and can aid in space construction projects.

Over the years, the U.S. has engaged in cooperative space ventures, in one form or another, with over 40 nations around the world.

Why hasn't the United States developed means of rescuing men who are in trouble on space missions?

The United States had no space rescue capability for many years, but minimized risk by using only astronauts who were highly skilled engineers and test pilots, trained to meet every conceivable space contingency.

Today's astronauts are just as skilled, but their talents cover a wider range of scientific and engineering disciplines. Several of the new astronauts selected for the Space Shuttle program are medical doctors, and have been developing techniques for dealing with medical emergencies in a zero-gravity environment.

Also, the United States will eventually have a small fleet of Shuttle orbiters, each of which could be used by a crew of astronauts to aid or rescue the crew of a disabled ship.

Are there plans for a manned mission to Mars? What about the other planets? Are we making plans to explore them?

NASA has no present plans for a manned mission to Mars, or to any other planet. Knowledge about planets other than Earth is being acquired by unmanned spacecraft. Unmanned Pioneers have returned close-up observations of Jupiter and Saturn, and Mariners of Mars, Venus, and Mercury.

In 1976, two Viking spacecraft soft-landed on Mars and conducted an intensive search for life. None was found, but a tremendous amount of information was obtained. In 1978 a Pioneer Venus Multiprobe sent four shielded scientific capsules down through the Venusian atmosphere, and a Pioneer Orbiter began obtaining radar profiles that led to the first map of the planet's surface. Two Voyager spacecraft examined Jupiter and five of its moons in 1979 and Saturn and eight of its moons in November 1980 and August 1981. The second one is heading for an encounter with Uranus in 1986 and possibly Neptune in 1989.

NASA has very long-range plans for returning to the Moon, but not for many years. The Space Shuttle does not provide the ability to carry humans out of Earth orbit, and other vehicles must be developed before this will again become possible.

When will NASA have a permanent space station in orbit?

President Reagan in early 1984 directed NASA to build and man a permanent orbiting space station "within a decade." Studies are now being done on the best configuration, and construction of the hardware will start within two or three years. Most of the ten-year period will be required to plan and build the station on the ground. Carrying the component parts into orbit and assembling them there would probably take a year or less.

How much does a spacecraft weigh in space?

A spacecraft in orbit around Earth is said to be in a state of weightlessness, also called zero-gravity, or zero-g. Weightlessness does not mean that the gravity of Earth has disappeared. Rather, it means that the forward velocity imparted by the spacecraft's launch vehicle balances the downward pull of gravity. Put another way, gravity and motion interact to hold the spacecraft in orbit, where it is weightless. The spacecraft's movement may be described as falling toward the Earth, but with the curved surface below moving further away at a rate equal to the amount of fall. Everything in the spacecraft is also weightless, as is anything which separates from it. The weightless condition also applies to spacecraft on long journeys between planets, because they are effectively countering the gravitational pull of the Sun by forward motion.

How is the Shuttle space suit different from the suits used in previous programs?

The Shuttle backpack life support system is far less bulky and much more comfortable. It is also more versatile and easier to manage. In previous programs, an entirely new space suit was worn on each flight, custom-tailored to fit each astronaut. But Shuttle suits come in standard pieces which can combine to fit either male or female crewmembers of different sizes. Because these pieces may be repaired and reused for six years or more, it now costs much less to outfit our astronauts.

How can I write to an astronaut or receive an astronaut's autograph?

Address your letter or request to: Astronaut Office, Code CB, Johnson Space Center, Houston, TX 77058. But please remember that astronauts are very busy and cannot always answer as many letters as they might like to.

How can I become an astronaut?

Any qualified adult man or woman may become an astronaut. The astronaut of today usually has college education beyond a bachelor's degree – often a doctorate in medicine, engineering, or a science – and is in excellent physical condition. Astronaut recruiting occurs periodically. Write the Astronaut Office, as above, for information.

What courses should I take in school in order to become a NASA astronaut, scientist or engineer? What college should I attend?

Career and educational guidance may be very important to your future and should be given on an individual basis. We suggest that you talk with your school guidance counselor, and with college representatives visiting your school. But please remember that astronaut jobs in particular are very scarce.

Can I be a passenger on the Space Shuttle?

NASA will start taking passengers up on Space Shuttle missions in late 1985 or 1986, probably about two per year. No waiting lists will be kept or applications accepted prior to the opening of a particular slot, which will be announced to the media. The terms and requirements will be widely publicized. Watch for the announcements, and if you fit the category of person sought for the particular mission, apply at that time.

How does an astronaut go to the bathroom in space (blow his nose or scratch an itch, etc.)?

The Space Shuttle orbiter contains a commode and urinal that can be used by both men and women. Designed to be as Earth-like as possible, it substitutes airflow for water and gravity. This airflow draws the waste into storage compartments, which are emptied upon return to Earth. The air is filtered to remove dirt, bacteria, and odor and returned to the orbiter cabin. While in orbit, the commode is vented to space vacuum to deactivate bacteria and thus prevent odor formation.

Nose-blowing in a pressurized suit is not feasible. However a small piece of rough cloth inside the helmet now makes it possible for an astronaut to scratch his nose.

What is a launch window?

The precise period in which lift-off must occur is called the "launch window." For example, a preset launch time is required when a spacecraft is to rendezvous with another object already in orbit, whether this be the Moon, a planet, or another spacecraft. Calculation of the launch window for rendezvous with the Moon, for example, included taking into account the lunar landing site, sunlighting at that site, and azimuth (direction) limitations.

How were the NASA program names (such as Mercury, Gemini, and Apollo) chosen?

Officials considered various suggested names and finally agreed on one. Sometimes the names were descriptive, such as Skylab and Space Shuttle. Gemini — Latin for twins — refers to the fact that the Gemini spacecraft held two astronauts. Names such as Mercury and Apollo are much more symbolic than descriptive.

What are the names of the Shuttle orbiters?

The first one constructed, which was not designed for space flight, was named *Enterprise*. *Columbia* was NASA's second orbiter and the first to operate in space. Number three, *Challenger*, was originally built as a vibration test article and later transformed into a fully operational spaceship. The last two are *Discovery* and *Atlantis*.

Whatever happened to Enterprise?

After completion of the Shuttle Approach and Landing Tests in 1977, *Enterprise* was used to check for mechanical and electrical compatibility with facilities and equipment at the Shuttle launch site at Kennedy Space Center. Since then, it has been used extensively as a testbed for weight and balance tests, vibration tests and failure detection experiments, and has even been "cannibalized" for spare parts for orbiter *Columbia*. It was taken to Europe aboard the 747 carrier aircraft for a tour in 1983, and stayed at New Orleans throughout the World's Fair in 1984.

What happens to used spacecraft?

In previous programs such as Apollo, spacecraft which returned to Earth underwent post-flight checkouts that yielded additional information on their performance. Some then went on public display. These can be seen at NASA centers and at the National Air and Space Museum of the Smithsonian Institution, Washington, D.C.

Can I obtain space items from NASA?

No. Hardware and other items that have no further direct value to the space program usually go to public institutions or museums for display so that people from all over the world may see them. Moon rocks, moon dust, samples of space food, telescopes, binoculars, lasers, old space suits, Shuttle thermal protection tiles or pieces of tile, and other space artifacts are not available. Blueprints, flight plans, designs, transcripts, and other printed materials are prepared in limited quantity for distribution only to engineers, analysts, and other required personnel. Some items are made available to the news media.

Visitors to the Kennedy Space Center may purchase souvenir items from the gift shop operated by a concessionaire at the visitors center, Spaceport USA. Models of spacecraft and launch vehicles, and the badges, decals, and emblems representing various space missions, may be purchased here or by mail from:

TW Services, Inc.
Visitors Center-TWS
Kennedy Space Center, FL 32899

The NASA Exchange
Johnson Space Center
Houston, TX 77058

Model rockets (models that contain propellant and can be launched) are available at some toy and hobby stores.

Can engineers at the Kennedy Space Center evaluate my inventions (drawings or plans)?

Sorry, we do not have the workforce available to handle the tremendous number of requests we receive. And since it would be unfair to process some and not others, we therefore do not handle any.

How can I obtain NASA educational materials?

NASA educational and informational publications may be purchased from: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Some NASA centers provide free materials on request.

Can I obtain space photographs from NASA?

Color photographs are so costly NASA cannot provide them free of charge. If the NASA installation nearest you has a Visitors Center with a souvenir shop, photographs may be purchased there for one or two dollars each. They are also available through the mail from a private contractor, though this is somewhat more expensive. Serious inquiries (preferably on letter-head stationary) should be addressed to: Space Photographs, PO Box 486, Bladensburg, MD 20710.

Photographs of geographical areas of the United States, taken from space by LANDSAT spacecraft, are also available for purchase. For information write or telephone:

U.S. Geological Survey, (605) 594-6511
User Services Unit
EROS Data Center
Sioux Falls, SD 57198

How can I obtain information on the results of planetary missions?

Many libraries now have magazines or other publications on hand reporting some of the findings by NASA spacecraft; two such publications are *National Geographic* and *Science News*. Three official publications—*Images of Mars* (Stock No. 033-00000793-1), *Voyager Encounters Jupiter* (Stock No. 033-00000772-8), and *Voyager 1 Encounters Saturn* (Stock No. 033-000-00817-1)—may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Write for price information and a listing of other publications.

Can I become a member of a NASA club or have my name put on a pen pal list?

NASA does not maintain a list of pen pals, but it does work with school systems on various educational programs. One of these, conducted by the National Space Institute with NASA help, is a "young astronaut" program for elementary schools. Your teacher can obtain more information from: The National Space Institute, 600 Maryland Ave. S.W., West Wing, Suite 203, Washington, D.C. 20034. There are a number of other pro-space organizations throughout the country soliciting memberships. You can obtain addresses for these from your local library.

Can my name be put on a mailing list to receive NASA publications?

No. We receive and answer a large volume of mail daily, but cannot maintain a regular mailing list.

Can I subscribe to any NASA publications?

A monthly agency magazine, NASA Activities, is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

NOTE: We appreciate your interest in the space program and trust that the materials received will prove helpful. Additional information on space and the solar system should be available in current reference books and encyclopedias, maintained by most school and community libraries.

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